Remarks

Applicants thank Examiner Deo for the careful examination of this application and the clear explanation of the rejections. In response to the Office Action, applicants amend claim 2 to overcome the 112 rejection to claim 2 and subsequent rejections to claims 6 – 8. Referring to the remaining rejections, applicants respectfully respond as follows:

1. The 102(b) rejection against claim 1 is improper because all elements of limitation in claim 1 are not disclosed in the Zheng reference.

Claim 1 describes a method for forming shallow trench isolation structures. It comprises the following steps and limitations:

a. forming a plurality of isolation trenches in a substrate separating active areas in the substrate;

b. forming an insulation layer outwardly from the substrate that :

i. fills the isolation trenches;

ii. covers the active areas; and

iii. is substantially conforming to the substrate surface contour;

c. forming a planarization layer outwardly from the insulation layer that has an outward surface that is substantially flat; and

d. removing the planarization layer and the insulation layer by a removing process that removes the planarization layer and the insulation layer at substantially the same rate.

In contrast, the Zheng reference, which discloses a method for shallow trench isolation, does not disclose at least element (b) (iii) - forming an insulation layer outwardly from the substrate that is substantially conforming to the substrate surface contour and element (c) - forming a planarization layer ... that has an outward surface that is substantially flat.

The section in the Zheng reference used in the Office Action to support the 102(b) anticipation on the insulation layer is the following:

> Referring now to FIG. 3, a layer of high density plasma oxide (HDP) 18 is deposited by chemical vapor deposition (CVD) to a thickness of between about 6000 and 10,000 Angstroms over the surface of the substrate and filling the trenches. The HDP oxide is deposited using a SiH_4, O_2, and Ar chemistry and an inductively coupled plasma source to generate a high density plasma. Ozone-TEOS is poorer in quality than HDP oxide because it is deposited with the strong oxidizer ozone which enhances the reaction. HDP oxide is deposited with SiH_4 and O_2; the high energy ions will also make the film more dense.
>
> HDP oxide is deposited with simultaneous sputtering of SiO_2 at the corner, *resulting in a 45 degree faceted oxide profile. The sputter rate over the narrow areas is greater than the sputter rate over the wide areas. This results in a greater thickness of the HDP oxide over wide areas than over narrow areas.* (emphasis added)[1]

A layer of HDP oxide that is thick over the wide areas and thin over the narrow areas and is 45 degree at the corners is not substantially conforming to the substrate surface contour.

The section in the Zheng reference used in the Office Action to support the 102(b) anticipation on the planarization layer is the following:

> Referring now to FIG. 4, a layer of spin-on-glass 20 is coated over the HDP oxide layer 18. The spin-on-glass material may be a silicate or a siloxane material. The spin-on-glass material suspended in a vehicle or solvent is deposited onto the semiconductor wafer surface and *uniformly spread thereover* by the action of spinning the wafer. The material fills the indentations in the integrated circuit wafer surface. Most of the vehicle or solvent is driven off by a low temperature baking step.
>
> Optionally, the spin-on-glass can be coated using a rotary cup. By using a rotary cup with cap, the solvent will evaporated much more slowly to allow the spin-on-glass to fill the lower regions better. *Hence, the final step height is much reduced.* (emphasis added)[2]

A layer that is uniformly spread over an uneven surface does not form a layer surface that is substantially flat. Similarly, a spin-on-glass that has

[1] U.S. 5,728,621, col. 2, ll. 43-59.
[2] Id, col. 2, l. 64 – col. 3, l.10.

different step heights at various locations, even if the heights are reduced, does not anticipate a layer surface that is substantially flat.

Because the Zheng reference fails at least to disclose the two elements of limitation in claim 1, it does not anticipate claim 1. Therefore claim 1 stands patentable over the Zheng reference.

2. The 102(b) rejection against claim 13 is improper because all elements of limitation in claim 13 are not disclosed in the Zheng reference. Claim 13 has the same two elements of limitation set forth in Section 1 that are missing from the Zheng reference.

Because the Zheng reference fails at least to disclose the two elements of limitation in claim 13, it does not anticipate claim 13. Therefore claim 13 stands patentable over the Zheng reference.

3. The rejections against the dependent claims 2 – 11 are improper because claims 2 – 11 depend directly or indirectly on patentable claim 1 with additional elements of limitation.

In particular, claim 2 further includes an etching step and a chemical-mechanical-polishing step; claims 3 and 5 further limit the etch rate of the etching step; claim 4 further limits the etch to a plasma etch; claim 6 further adds an structural element to the polish stop and further includes a removing step; claim 7 further limits the removing step; claim 8 further limits the composition of the polish stop layer, claim 9 further limits the composition of the insulation layer; claim 10 further limits the composition of the planarization layer; and claim 11 further limits the thickness of the polish stop.

Since claims 2 – 11 comprise elements of limitation not disclosed in the references, they stand patentable over the references.

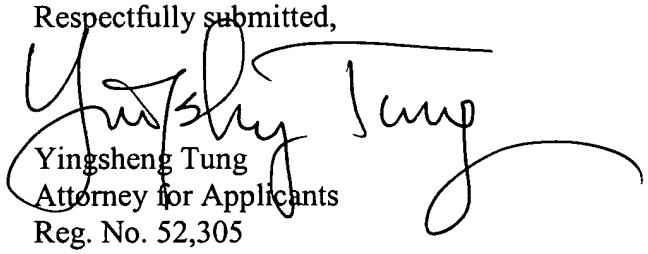
4. The rejections against the dependent claims 14 – 20 are improper because claims 14 – 20 depend directly or indirectly on patentable claim 13 with additional elements of limitation.

In particular, claims 14 and 15 further include an etching step with limitation on the etch rate; claim 16 further limits the etch to a plasma etch; claim 17 further adds an structural element to the polish stop and further includes a removing step; claim 18 further limits the composition of the insulation layer; claim 19 further limits the composition of the planarization layer; and claim 20 further limits the thickness of the CMP depth.

Since claims 14 – 20 comprise elements of limitation not disclosed in the references, they stand patentable over the references.

In conclusion, applicants respectfully submit that as amended, the application is in allowable form, the pending claims distinguish over the references. Applicants respectfully request that the rejections be withdrawn, the application be further examined and the claims pass to allowance.

Respectfully submitted,



Yingsheng Tung
Attorney for Applicants
Reg. No. 52,305

Texas Instruments Incorporated
P. O. Box 655474, MS 3999
Dallas, Texas 75265